

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1. (Currently Amended) A device for the noninvasive detection of the properties of a medium by interferometry, this device comprising:
  - an optical source for illuminating at least one region of the medium to be probed, with a light beam whose path defines an optical axis;
  - means for measuring the variations in the phase of the light beam during its passage through the region to be probed, these measurement means
    - comprising an interferometer for splitting the light beam into a reference beam and a probe beam, and means for servocontrolling the path lengths of the reference beam and of the probe beam, in this interferometer the ~~servocontrol~~ of the respective path lengths of the reference beam and of the probe beam being active servocontrolled up to a cutoff frequency  $f_c$  and
    - having a signal sampling frequency  $f_a$ ,wherein said device further includes ~~scanning~~ means ~~suitable~~ for scanning, with the probe beam, the region to be probed and a reference region with an image acquisition frequency  $f$  for the images recorded by the means for measuring the variations in the phase of the light beam above the cutoff frequency  $f_c$ .
2. (Currently Amended) The device as claimed in claim 1, wherein the ~~scanning~~ means for scanning scan the region to be probed and the reference region along a first direction in space at a frequency  $f_x$  and along a second direction in space at a frequency  $f_y$ , in order to form an image of  $n$  pixels along the first direction and  $m$  pixels along the second direction, the frequencies  $f_x$  and  $f_y$  being chosen such that  $f_x = f_y/n$  and  $f_y = f_a/m$ ,  $f_x$  and  $f_y$  being greater than  $f_c$ .

3. (Previously Presented) The device as claimed in claim 1, wherein the means for measuring the variations in the phase of the light beam comprise a confocal microscope in which the region to be probed is placed in a manner suitable for forming an image of a plane of the region to be probed.

4. (Currently Amended) The device as claimed in claim 1, comprising means for moving the medium, along the three directions in space, ~~in the probe beam~~ while maintaining the medium in contact with the probe beam.

5. (Currently Amended) The device as claimed in claim 1, wherein the ~~scanning~~ means for scanning comprise four acoustooptic deflectors, two for deflecting the light beam, upstream of the confocal microscope, each in one of the first and second directions in space respectively, and two for rectifying the light beam, each in one of the first and second directions in space respectively, downstream of the confocal microscope.

6. (Previously Presented) The device as claimed in claim 5, wherein at least one acoustooptic deflector, downstream of the confocal microscope is set so as to make the 0th-order of the light beam inclined to the optical axis and to retain the paraxial 1st-order.

7. (Cancelled).

8. (Previously Presented) The device as claimed in claim 1, which further includes, upstream of the confocal microscope, means for controlling the polarization of the probe beam incident on the region to be probed.

9. (Currently Amended) A method of noninvasively detecting the properties of a medium by interferometry, ~~wherein~~ comprising the steps of:

- illuminating at least one region of the medium to be probed is ~~illuminated~~ with an optical source that generates a light beam, the path of which defines an optical axis;
- ~~splitting an interferometer is used to split~~ the light beam into a reference beam and a probe beam by using an interferometer and to measure the measuring phase shift between the reference beam and the probe beam after the latter has passed through the region to be probed;
- detecting and recording the probe beam with means for measuring the phase shift of the light beam;
- ~~the servocontrolling~~ respective path lengths of the reference beam and the probe beam ~~are servocontrolled by photodetection~~ using means for performing photodetection; and
- acquiring images corresponding to the measurement of the phase shift at various points in the region to be probed ~~are acquired~~, with the photodetection means, at a signal sampling frequency  $f_a$  above ~~the a~~ a cutoff frequency  $f_c$  for servocontrolling the respective path lengths of the reference beam and the probe beam,

wherein the method further comprising the step of scanning the region to be probed and a reference region ~~are scanned~~ with the probe beam at an image acquisition frequency  $f$  for images recorded by ~~the~~ means for measuring the variations in the phase of the light beam above the cutoff frequency  $f_c$ .

10. (Previously Presented) The method as claimed in claim 9, wherein the region to be probed and the reference region are scanned along a first direction in space at a frequency  $f_x$  and along a second direction in space at a frequency  $f_y$ , in order to form an image of  $n$  pixels along the first direction and  $m$  pixels along the second direction, the frequencies  $f_x$  and  $f_y$  being chosen such that  $f_x = f_y/n$  and  $f_y = f_a/m$ ,  $f_x$  and  $f_y$  being greater than  $f_c$ .

11. (Previously Presented) The method as claimed in claim 9, wherein the region to be probed is placed in a confocal microscope in a manner suitable for forming an image of one plane of the region to be probed.

12. (Currently Amended) The method as claimed in claim 9, wherein the medium is moved, along the three directions in space, ~~in the probe beam~~ while maintaining the medium in contact with the probe beam.

13. (Currently Amended) The method as claimed in claim 9, wherein the medium is excited at a frequency  $f_e$  and the variation in the phase of the probe beam relative to that of the reference beam is measured at this same frequency  $f_e$ .

14. (Previously Presented) The method as claimed in claim 9, wherein the 0<sup>th</sup> - order of the light beam is deflected relative to the optical axis by means of at least one acoustooptic deflector, downstream of the confocal microscope, and the paraxial 1<sup>st</sup> - order is retained.

15. (Cancelled).

16. (Previously Presented) The method as claimed in claim 9, wherein the region to be probed includes at least one part of an optoelectronic component to which a potential is applied.

17. (Previously Presented) The method as claimed in claim 16, wherein the potential is applied via at least one electrode, the shape of which is suitable for creating an electric field gradient.

18. (Previously Presented) The method as claimed in claim 16, wherein the potential is applied via at least one multipolar electrode.

19. (Previously Presented) The method as claimed in claim 16, wherein the optoelectronic component is placed in an optically active medium.

20. (Previously Presented) The method as claimed in claim 16, wherein the propagation of an electrical pulse in the optoelectronic component is studied.

21. (Previously Presented) The method as claimed in claim 9, wherein the region to be probed includes at least one part of a fractal aggregate.

22. (Previously Presented) The method as claimed in claim 9, wherein the region to be probed includes at least one part of a biological medium.

23. (Previously Presented) The method as claimed in claim 22, wherein the region to be probed includes at least one part of a biological membrane.
24. (Previously Presented) The method as claimed in claim 22, wherein the region to be probed includes at least one part of a neuron or of a neural network.
25. (Previously Presented) The method as claimed in claim 9, wherein the region to be probed includes at least one part of an artificial membrane.
26. (Previously Presented) The method as claimed in claim 9, wherein the region to be probed constitutes at least one part of a chemical medium.
27. (Currently Amended) The method as claimed in claim 9, wherein the medium is doped with molecules or ions having electrooptic properties, or conferring electrooptic properties on the medium, so as to accentuate the electrooptic properties of the medium, if ~~the~~ latter said medium is already endowed therewith, or to reveal the presence of electric fields in a medium that does not possess such properties intrinsically.
28. (Currently Amended) The method as claimed in claim ~~[[9]]~~ 27, wherein, knowing the distribution of the electrooptic properties of the medium, a mapping of the electric field in the medium is carried out.
29. (Previously Presented) The method as claimed in claim 9, wherein an electric field of known configuration is generated in the medium so as to reveal electrooptic properties of the medium.